

2.0 Background

UAS operations have increased dramatically during the past several years in both the public and private sectors. In response to this increasing activity, it has become necessary to develop guidance for Federal Aviation Administration to use when evaluating applications for certificate(s) of waiver or authorization and special airworthiness certificates. This guidance is not meant as a substitute for any regulatory process. This guidance was jointly developed by, and reflects the consensus opinion of:

- The Unmanned Aircraft Program Office (UAPO), FAA Aircraft Certification Service (AIR-160)
- The Flight Technologies and Procedures Division, FAA Flight Standards Service (AFS-400)
- The FAA Air Traffic Organization's Office of System Operations and Safety, (AJR-3).

3.0 Definitions

The following definitions apply to terms used in this document.

- **Airworthiness:** A condition in which the aircraft, airframe, engine, propeller, accessories, and appliances meet their type design and are in a condition for safe operation.
- **Chase aircraft:** A manned aircraft flying in close proximity to an unmanned aircraft that carries, in addition to the pilot in command (PIC) of the aircraft, a qualified visual observer.
- **Cooperative aircraft:** Aircraft that have an electronic means of identification (i.e., a transponder) aboard and operating.
- **Inspection:** The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of an aircraft up to and including its overhaul or life limits.
- **Non-Cooperative aircraft:** Aircraft that do not have an electronic means of identification (i.e., a transponder) aboard or not operating such equipment due to malfunction or deliberate action.
- **Off-Airport:** Any location used to launch or recover an unmanned aircraft that is not considered an airport (i.e., an open field).
- **Pilot in Command (PIC):** The person who has final authority and responsibility for the operation and safety of flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the pilot in command as described by 14 CFR 91.3, *Responsibility and Authority of the Pilot in Command*, apply to the unmanned aircraft PIC. The pilot in command position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

- **Public aircraft:** An aircraft operated by a public user which is intrinsically governmental in nature (i.e. federal, state, and local agencies). Examples of public entities are Department of Defense (DoD) and its military branches; other local, state, and federal government agencies; and state universities. Refer to 14 CFR 1.1, *General Definitions*, for a complete definition of a public aircraft.
- **Scheduled Maintenance (Routine):** The performance of maintenance tasks at prescribed intervals.
- **Supplemental Pilot:** Supplemental pilots are those pilots assigned unmanned aircraft flight duties to augment the pilot in command. It is common for applicants to have both an “internal” and an “external” unmanned aircraft pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the pilot in command if they meet the qualifications.
- **Unmanned Aircraft:** A device used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. Unmanned aircraft are understood to include only those aircraft controllable in three dimensions and therefore, exclude traditional balloons and un-powered gliders.
- **Unscheduled Maintenance (Non-Routine):** The performance of maintenance tasks when mechanical irregularities occur. These irregularities are categorized as to whether or not they occur during flight time.
- **Visual Line-of-Sight:** A method of control and collision avoidance that refers to the pilot or observer directly viewing the unmanned aircraft with human eyesight. Corrective lenses (spectacles or contact lenses) may be used by the pilot or visual observer. Aids to vision, such as binoculars, field glasses, or telephoto television may be employed as long as their field of view does not adversely affect the surveillance task.
- **Visual Observer:** A trained person who assists the unmanned aircraft pilot in the duties associated with collision avoidance. This includes, but is not limited to, avoidance of other traffic, clouds, obstructions and terrain.

4.0 Methods of Authorization and Applicability

Guidance in this document of an operational nature always applies to both civil and public operators. In the areas of pilot certification, crew certification, pilot currency, medical certificates, and airworthiness, it is assumed that all public aircraft comply with processes and policies established by the public entity, in a manner similar to publicly operated manned aircraft. If no established policies exist regarding pilot certification, crew certification, pilot currency, medical certificates, and airworthiness, it is highly recommended that the public agency/department apply the guidance outlined in this document.

The procedures contained in this document are applicable for operations in the contiguous United States, Alaska, Hawaii, and the Flight Information Regions delegated to the United States and areas where the FAA is the Air Traffic Service Provider.

In general, specific authorization to conduct unmanned aircraft operations in the NAS outside of active Restricted, Prohibited, or Warning Area airspace must be requested by the applicant. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated. The two methods of approval are either a certificate of waiver or authorization (COA) or the issuance of a special airworthiness certificate.

The guidance information presented in this document applies to approvals for both COA and special airworthiness certificates. Unless otherwise stated, recommended procedures and guidance that appear in this document apply to both.

The applicability and process to be used in a UAS operational approval is dependent on whether the applicant is a civil user or a public user. A public user is one that is intrinsically governmental in nature (i.e. federal, state, and local agencies). Public applicants should utilize the COA application process. Civil applicants must utilize the special airworthiness process.

Regardless of authorization method, all UAS applications are ultimately processed through ATO, UAPO, Flight Standards, and Aircraft Certification staff at the headquarters level for final approval and disposition.

Notes:

- *This document and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating systems for sport and recreation. Those individuals should seek guidance under Advisory Circular (AC) 91-57, Model Aircraft Operating Standards, which is currently under revision.*
- *Civil UAS operations require a special airworthiness certificate and should follow the process as specified in this document.*
- *AC 91-57 shall not be used as a basis of approval for UAS operations and is applicable to recreational and hobbyists use only.*

4.1 Certificate of Waiver or Authorization (COA)

Applications for a COA are only accepted from public entities. An application may be referred to the FAA Office of the Chief Counsel (AGC), for determination of the status of an applicant, i.e., public or civil. COAs are typically issued for a period of up to one year, but may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted wholly within an active Restricted, Prohibited or Warning Area airspace when operating with permission from the appropriate authority or using agency of that airspace.

4.1.1 General Process

Air Traffic Operations (ATO) is responsible for the COA process. Applications can be made on the internet or can be made on FAA Form 7711-2, *Application for Certificate of Waiver or Authorization*. If the application is made on FAA Form 7711-2 it will be sent to Headquarters ATO, through the local Air Traffic Service Area. ATO has developed a guidance checklist covering the application and approval process. This form and guidance material can be found on the internet at www.faa.gov/uas via the Air Traffic Airspace (ATA), Unmanned Aircraft Systems (UAS) Group link.

Prior to issuance of a COA, ATO normally requests a review of the COA application by the UAPO. Specifically, the AFS-400 members of the UAPO evaluates each application to determine if risks associated with the operation have been acceptably mitigated. Formal recommendations are forwarded to ATO from the UAPO at the conclusion of the review process.

4.1.2 National Security Considerations

When the Department of Defense or the Department of Homeland Security declares a UAS operation is a matter of “national security,” the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this guidance document. In this case, national security itself may override risk mitigation requirements and the applicant must declare in the COA application acceptance of all risks associated with the UAS operations. In general, such requests should be directed to the Administrator, Federal Aviation Administration, from an equivalent level individual of the applicant’s organization.

4.2 Special Airworthiness Certificate

Civil applicants are required to apply for a special airworthiness certificate, typically, an experimental airworthiness certificate. The applicant is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station(s) is designed, built, and maintained in a safe and airworthy condition. Experimental airworthiness certificates are typically issued for a period of up to one year. Experimental airworthiness certificates are typically issued to industry and manufacturers wishing to accomplish UAS research and development, testing, crew training, and market survey in accordance with 14 CFR Part 21.191. In cases where an applicant has been issued a special airworthiness certificate, and concurrently operates a corresponding UAS on a COA in support of a public activity, the applicant must elect, prior to each flight, what authority is to be used to conduct the flight. The use of both a special airworthiness certificate and a COA authorization on a single flight is not permitted.

4.2.1 General Process

For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Certification Division, AIR-200, at FAA headquarters is responsible for the issuance of special

airworthiness certificates. The issuance of an experimental airworthiness certificate is coordinated with the UAPO as well as AVS and ATO personnel at the headquarters and regional levels. A thorough review is conducted by this team to evaluate the system's airworthiness and operational specifics and to determine mitigations required to meet acceptable standards of safety.

5.0 Alternate Methods of Compliance

All limitations and procedures presented in this guidance document are to be considered as general guidelines only. Each application needs to be evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems. As such, deviations and alternate methods of compliance may be approved and may differ from the information presented in this document. Therefore, if the applicant makes a safety case and presents sufficient data for an alternate means of compliance, then this data should be taken into consideration and evaluated for possible approval.

6.0 UAS Airworthiness

All UAS must be shown to be airworthy to conduct flight operations in the NAS. UAS should be maintained and conform to the same airworthiness standards as defined for the 14 CFR parts under which UAS are intended to be operated. The FAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined.

In the future, UAS Maintenance Technician certification will parallel existing standards for manned aviation. As with airworthiness standards, Maintenance Technicians Requirements will be reviewed as part of the data collection process.

6.1 Public Applicants

The applicant must provide an airworthiness statement specifying compliance with the proponent's applicable airworthiness policy or criteria. Examples of acceptable policy/criteria include, but are not limited to:

- DoD: MIL-HDBK 516B, *Airworthiness Certification*
- Air Force: AFD 62-6, *USAF Aircraft Airworthiness Certification*
- Army: AR 70-62, *Airworthiness Qualification Of US Army Aircraft Systems (Level 1)*
- Navy and Marine Corps: NAVAIRINST 13034.1C, *Flight Clearance Policy for Air Vehicles and Aircraft Systems*.

Note: As an example, an airworthiness statement could include words to this effect: This COA application for (name of UAS) has been reviewed on behalf of the (name of applicant or agency) in accordance with (MIL-HDBK-516 or specified alternative method) and has been determined to be airworthy to operate as specified in this application subject to the following restrictions (specify the conditions). The statement should be on letterhead paper and both dated and signed by the responsible reviewing authority.

6.2 Civil Applicants

Approvals for civil applications using the special airworthiness process receive their airworthiness certification as part of the review process with the FAA.

7.0 Continued Airworthiness

Applicants for UAS operational approvals must address continued airworthiness procedures as part of their application. It is highly recommended that all applicants provide the following information: a Continuing Airworthiness Program, a Maintenance Training Program, any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation and a process to report any applicable data relating to the operation and maintenance of the UAS. All information that is received from UAS operators will aid the FAA in tracking the various existing UAS types and operations. This data will help expedite the regulatory process for UAS and allow the FAA to have a historical data base from which to base current and future UAS regulatory guidance. Accurate recordkeeping is essential in assuring positive operational and quality airworthiness control.

8.0 Flight Operations

8.1 General

The guidance presented in this document applies only to those UAS operations affecting areas of the NAS other than active Restricted, Prohibited, or Warning Areas. The FAA is particularly concerned that UAS operate safely among all users of the NAS, including non-cooperative aircraft and other airborne operations not reliably identifiable by radar (i.e., balloons, gliders, parachutists, etc).

Unless specifically authorized, UAS operations in other than active Restricted, Prohibited, or Warning Areas, or Class A airspace shall require visual observers, either airborne or ground-based.

While considerable work is ongoing to develop a certifiable “detect, sense, and avoid” system, no current solution exists. As a result, compliance with the “see and avoid” aspect of 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*, becomes one of the primary issues in UAS operational approvals. As a result, alternate methods of compliance are required to accomplish the “see and avoid” function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system, however, the FAA approves UAS flight activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

Applicants proposing “see and avoid” strategies in lieu of visual observers, need to support proposed mitigations with system safety studies which indicate the operations can be conducted

safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an “extremely improbable” determination.

It is the applicant’s responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UA with performance characteristics that impede normal air traffic operations may be restricted in their operations.

8.1.1 System Considerations

- **Onboard Cameras/Sensors:** Although onboard cameras and sensors that are positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of deconfliction are still quite limited. Therefore, these types of systems may not be considered as a sole mitigation in the see and avoid risk assessment. In general, current designs are not mature and have shown to be insufficient to provide the sole mitigation in the see and avoid risk assessment. Although these systems are currently immature, applicants may be allowed to propose any system solution that provides a mitigation strategy and should be evaluated as a potential solution.
- **Radar and Other Sensors:** If special types of radar or other sensors are utilized to mitigate risk, the applicant must provide supporting data which demonstrates that:
 - both cooperative and non-cooperative aircraft, including targets with low radar reflectivity, such as gliders and balloons, can be consistently identified at all operational altitudes and ranges, and,
 - the proposed system can effectively deconflict a potential collision.
- **Lost Link Procedures:** In all cases, the UAS must be provided with a means of automatic recovery in the event of a lost link. There are many acceptable approaches to satisfy the requirement. The intent is to ensure airborne operations are predictable in the event of lost link.
- **Flight Termination System (FTS):** It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system that can be activated manually by the UAS PIC, may be required to safeguard the public.

8.2 Operational Requirements

Unless operating in an active Restricted, Prohibited, or Warning Area, UAS operations must adhere to the following requirements.

8.2.1 Observer Requirement: VFR UAS operations may be authorized utilizing either ground-based or airborne visual observers onboard a dedicated chase aircraft. A visual observer is required to perform the see and avoid function as alternative compliance to 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*.

The task of the observer is to provide the pilot of the UAS with instructions to steer the UA clear of any potential collision with other traffic. Visual observer duties require the ability to maintain visual contact with the UA at all times while scanning the immediate environment for potential conflicting traffic. At no time will the visual observer permit the UA to operate outside their line-of-sight. This ensures that any required maneuvering information can be reliably provided to the PIC.

The visual limitation will specify both a lateral and vertical distance and shall be regarded as a maximum distance from the observer where a determination of a conflict with another aircraft can be made. When an application is approved by the FAA, the visual limitation distance becomes a directive upon the observer.

Generally, observers are to be positioned no greater than one nautical mile laterally and 3000 feet vertically from the UA. The use of nautical miles is based on the fact that the UA is being positioned by the pilot via control stations that typically use moving map displays that are referenced in nautical miles.

This distance is predicated on the observer's normal unaided vision. Corrective lenses, spectacles, and contact lenses may be used.

When using other aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within the approved visual limitation distance of the observer. Due to field of view and distortion issues, the use of such aids can be used to augment the observer's visual capability but cannot be used as the primary means of visual contact.

Although this guidance specifies an observer distance, the small size of some UA may not allow for adequate observation at the one mile limit. It should be understood that this limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, until an on site validation of observer distance is conducted by the FAA, it will remain the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions. Conversely, larger UA may accommodate an observer distance greater than the one mile limit. The applicant may establish a distance greater than one mile based on a variety of factors. Increased observer distances may be proposed by the applicant and will be subject to review by the FAA either by on site demonstration or other means.

If UAS applications are approved for nighttime operations with flight operations that will depart or arrive between sunset and sunrise, the ground observer(s) must be in place one hour prior to that operation to ensure acclimation to the twilight/nighttime environment.

8.2.2 ATC Communications Requirements: The UAS pilot must have immediate radio communication with appropriate ATC facilities anytime:

- the UA is being operated in Class A, D or sometimes E airspace (See 9.2.14 for operations in Class B or C Airspace)
- the UA is being operated under instrument flight rules (IFR)
- it is stipulated under the provisions of any issued COA or a special airworthiness certificate.

It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay; this is required for IFR flight.

8.2.3 Inter-Communications Requirements: Any visual observer, sensor operator, or other person charged with providing collision avoidance for the UA must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot shall be required at all times. If the UAS pilot is talking to air traffic control, monitoring of the air traffic control frequency by all UAS crew members (UAS pilots, observers, and chase pilots) is recommended for shared situational awareness. However, unless it is necessary, the UAS PIC or the supplemental pilots are the only crewmembers that will talk to Air Traffic Control.

8.2.4 Dropping Objects/Hazardous Materials: If the UA's intended operation includes the dropping or spraying of aircraft stores outside of active Restricted, Prohibited, or Warning Areas, the application must specifically address the hazard and make a clear case that injury to persons on the ground is extremely remote and operational risks have been sufficiently mitigated. A similar case must be made for hazardous materials carried aboard the UA.

8.2.5 Flight Over Populated Areas: Routine UAS operations shall not be conducted over urban or populated areas. UAS operations may be approved in emergency or relief situations if the proposed mitigation strategies are found to be acceptable.

8.2.6 Flight Over Heavily Trafficked Roads or Open-air Assembly of People: UAS operations shall avoid these areas. If flight in these areas is required, the applicant will be required to support proposed mitigations with system safety studies that indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination. Additionally, it is the applicant's responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UAS with performance characteristics that impede normal air traffic operations may be restricted in their operations.

8.2.7 Day/Nighttime Operations: All UAS operations outside of Class A airspace must be conducted during daylight hours. Nighttime operations may be considered in other airspace if the applicant provides a safety case and sufficient mitigation to avoid collision hazards at night. Examples of such may be transit operations in Class D airspace over a non-joint use military airfield adjacent to restricted airspace.

- 8.2.8 Flights Below Class A Airspace:** All UAS operations (IFR or VFR) outside of active Restricted, Prohibited or Warning Areas and below flight level (FL) 180 shall be conducted in visual meteorological conditions (VMC) and in accordance with 14 CFR 91.155, *Basic VFR Weather Minimums*, however, a minimum flight visibility of not less than three statute miles (SM) shall be maintained at all times. Cloud clearance requirements shall remain as specified in 14 CFR 91.155, *Basic VFR Weather Minimums*. Special VFR requirements per 14 CFR 91.157, *Special VFR Weather Minimums*, do not apply to UAS operations and cannot be exercised.
- 8.2.9 Autonomous Operations:** It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the national airspace system. Although the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.
- 8.2.10 Operations from Off-Airport Locations:** In most cases, an off-airport location should be situated no closer than five nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions and reasonable efforts should be made to keep operations away from structures and heavily trafficked roads. Due to the unique attributes of off-airport locations, approval requests need to be evaluated on a case-by-case basis.
- 8.2.11 Other Mitigations in lieu of Observers:** See Alternate Methods of Compliance section.
- 8.2.12 Operating Under Instrument Flight Rules (IFR):** While operating on an instrument flight plan, the following must exist, be completed, or be complied with:
- The pilot in command must hold a current instrument rating in a manned aircraft.
 - The aircraft's airworthiness statement includes IFR flight and all equipment is certified and working (including pitot static and transponder checks).
 - Aviation database and charts are current and available to the UAS pilot.
 - An IFR flight plan is filed.
 - An ATC clearance has been obtained and all clearances followed.
 - Direct two-way radio communication between the UAS pilot and ATC is available. Communication relay through the UA is required.
 - Pre-coordination with ATC has been accomplished.
 - The UA is equipped with a certified operating mode C (mode S preferred) transponder.
 - Visual observers are utilized in accordance with this guidance document.
 - ATC radar monitoring is available throughout the portion of the flight in Class A airspace.
 - All operations outside of Class A airspace and active Restricted, Prohibited, or Warning Areas shall be conducted in VMC conditions only.

8.2.13 Chase Aircraft Operations: The chase aircraft must remain at a safe distance from the UA to ensure collision avoidance should a UAS malfunction occur, but remain close enough to provide visual detection of conflicting aircraft in the path of the UA in a timely manner to advise the UAS PIC of the situation. Should the UAS pilot operate the UA from the chase aircraft, the chase aircraft must remain within radio control range of the UA to maintain appropriate signal coverage for flight control or activation of the flight termination system. Chase aircraft may be required to have communication with appropriate ATC facilities based on the applicant's application or mission profile.

- Chase aircraft are not required in Class A, active Restricted, Prohibited, or Warning Area airspace.
- Chase operations shall be conducted during daylight hours only.
- Flight visibility for all UAS chase operations shall be three statute miles or greater.
- Chase aircraft pilots must not concurrently perform either observer or UA pilot duties along with chase pilot duties.
- Chase aircraft operating as a formation flight will immediately notify ATC if they are using a non-standard formation.

Note: A standard formation is one in which a proximity of no more than 1 mile laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman.

Note: Nonstandard formations are those operating under any of the following conditions:

- *When the flight leader has requested and ATC has approved other than standard formation dimensions.*
- *When operating within an authorized altitude reservation (ALTRV) or under the provisions of a letter of agreement.*
- *When the operations are conducted in airspace specifically designed for a special activity.*

8.2.14 Airspace Considerations by Airspace Designation:

Note: UA operating in airspace designated as reduced vertical separation minimum (RVSM) airspace must comply with 14 CFR 91.180, Operations within Airspace Designated as Reduced Vertical Separation Minimum Airspace.

- **Class A:** Observers are not required in Class A. All UAS must be operating on an instrument flight plan. UAS operations approved for Class A must comply with 14 CFR 91.135, *Operations in Class A Airspace*.
- **Class B:** UAS operations are currently not authorized. Class B airspace contains terminal areas highest density of manned aircraft in the National Airspace System. As with all applications, the FAA will consider exceptional circumstances.

- **Class C and airspace within 30 nautical miles of an airport listed in 14 CFR 91.215:** Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class C must comply with 14 CFR 91.130, *Operations in Class C Airspace*, and 14 CFR 91.215, *ATC Transponder and Altitude Reporting Equipment and Use*. The transponder requirement will not be waived.
- **Class D:** Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with 14 CFR 91.129, *Operations in Class D Airspace*.
- **Class E:** If there is an operating Air Traffic Control Tower Class D rules may apply. UAS operations approved for Class E must comply with 14 CFR 91.127, *Operating on or in the Vicinity of an Airport in Class E Airspace*.
- **Class G:** UA operations approved for Class G must comply with 14 CFR 91.126, *Operating on or in the Vicinity of an Airport in Class G Airspace*.

8.3 Oceanic Operations

- 8.3.1 UAS operations wholly contained within Warning areas are handled in the same manner as those operations conducted in active Restricted and Prohibited areas, that is, no specific approval is required and observers or chase aircraft are not required.
- 8.3.2 **Flight Information Region Operations.** FAA rules and policies apply in the flight information regions (FIRs) where the FAA is the air traffic service provider. As such, the guidelines specified in this document apply to UAS operations conducted in these FIRs.

9.0 Personnel Qualifications

This section addresses the qualifications of UAS pilots, observers, maintainers, and other personnel as appropriate. All references to a pilot certificate refer to an FAA issued private pilot certificate or higher.

9.1 UAS Pilot Qualifications

The FAA is focused on insuring that UAS pilots have a common level of understanding of federal aviation regulations applicable to the airspace where the UA will operate. Pilots are responsible for a thorough preflight inspection of the UAS. They are accountable for controlling their aircraft to the same responsible standards as the pilot of a manned aircraft. Pilot qualifications for UAS operations conducted under IFR are addressed in this section. The following items apply to the pilots of all UAS:

- One pilot in command (PIC) must be designated at all times.
- The PIC of an aircraft is directly responsible, and is the final authority of, the operation of that aircraft.
- Pilots must not perform crew duties for more than one UAS at a time.
- Pilots are not allowed to perform concurrent duties both as pilot and observer.

9.1.1 Pilot in Command (PIC)

The designated PIC is the pilot responsible for the UAS flight operation. The PIC may be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the UA. It is common for applicants to have both an “internal” and an “external” UAS pilot. The PIC can assume any of these positions. The PIC duty may be rotated as necessary to fulfill operational requirements.

9.1.1.1 Ratings

Rating requirements for the UAS PIC depend on the type of operation conducted and fall into two categories:

- Operations that require a pilot certificate
- Operations that do not require a pilot certificate.

The requirement for the PIC to hold a pilot certificate is based on various factors including the location of the planned operations, mission profile, size of the UA, and whether or not the operation is conducted within or beyond visual line of sight. Operations without a pilot certificate may be allowed, permitting smaller UA to operate below certain altitudes while controlled strictly by visual line of sight. The cutoff point at which the smaller UA criteria will be utilized is yet to be defined; therefore, each application will be carefully reviewed to assess the feasibility of allowing that type of operation.

Operations requiring a pilot certificate: The PIC shall hold, at a minimum, an FAA pilot certificate under the following circumstances:

- All operations approved for conduct in Class A, C, D, and E airspace.
- All operations conducted under IFR (FAA instrument rating required).
- All operations approved for nighttime operations.
- All operations conducted at joint use or public airfields.
- All operations conducted beyond line of sight.
- At any time the FAA has determined the need based on the UAS’ characteristics, mission profile, or other operational parameters.

Note: *The FAA may require specific aircraft category and class ratings in manned aircraft depending on the UAS seeking approval and the characteristics of its flight controls interface.*

Operations not requiring a pilot certificate: The PIC *may not* be required to hold a pilot certificate for operations approved and conducted solely within visual line of sight in Class G airspace. For the PIC to be exempt from the pilot certificate requirement the following conditions must exist and the alternate compliance method described below must be followed:

- The operation is conducted in a sparsely populated location, and,
- The operation is conducted from a privately owned airfield, military installation, or off-airport location.
- Visual line of sight operations conducted no further than 1 NM laterally from the UAS pilot and at an altitude of no more than 400 feet above ground level (AGL) at all times.
- Operations shall be conducted during daylight hours only.
- Operations shall be conducted no closer than 5 NM from any airport or heliport.
- **Alternate Compliance Method:** In lieu of a pilot certificate, the PIC must have successfully completed, at a minimum, FAA private pilot ground instruction, and have passed the written examination.

Note: *The FAA may require an instrument rating in a specific aircraft category in manned aircraft depending on the UAS seeking approval and the characteristics of its flight controls interface.*

9.1.1.2 Currency

The applicant shall provide a process that ensures that the pilots receive an appropriate level of currency in the UAS being operated. At a minimum, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS in the previous 90 days.

For those operations approved for night operations, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS at night to a full stop in the previous 90 days.

For those operations that require a certificated pilot per section 10.1.1.1 above, the PIC, in order to exercise the privileges of his certificate, shall have flight reviews and maintain currency in manned aircraft per 14 CFR 61.56, *Flight Review* and 61.57, *Recent Flight Experience: Pilot in Command*.

For operations approved for night or IFR, the PIC shall maintain currency per 14 CFR 61.57, *Recent Flight Experience: Pilot in Command*, as applicable.

9.1.1.3 Medical

The PIC shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR part 67, and have it in their possession.

9.1.1.4 Training

In addition to the aforementioned training required for a pilot certificate, UAS pilots will have additional training in all specific details of the UAS being operated including normal, abnormal, and emergency procedures. This must include manufacturer specific training (or military equivalent), demonstrated proficiency, and testing in the UAS being operated.

9.1.2 Supplemental Pilots

Supplemental pilots are those pilots assigned UA flight duty to augment the PIC. It is common for applicants to have both an “internal” and an “external” UA pilot. The supplemental pilot can assume any of these positions.

9.1.2.1 Ratings

No specific rating is required for supplemental pilots unless they are assuming the role of pilot in command. However, at a minimum, they must have successfully completed private pilot ground school and have passed the written test.

9.1.2.2 Currency

The applicant shall provide a process that ensures that the pilots maintain an appropriate level of currency in the UAS being operated.

9.1.2.3 Medical

Supplemental pilots shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR part 67, and have it in their possession. Any supplemental pilot acting as a dedicated visual observer or flying the UA on a visual basis shall also maintain a valid FAA Class 2 medical certificate.

9.1.2.4 Training

In addition to all training required for receiving and maintaining a pilot certificate, the UAS pilot shall be additionally trained in all specific details of the UAS being operated including normal, abnormal, and emergency procedures.

9.2 Observer Qualifications

All observers must have an understanding of federal aviation regulations applicable to the airspace where the UA will operate. Observers are considered a crewmember of the UAS. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as pilot and observer.

9.2.1 Medical

All observers shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR 67, and have it in their possession. 14 CFR 91.17, *Alcohol or Drugs*, applies to all UAS crewmembers, including observers.

9.2.2 Training

Observers must have completed sufficient training to communicate to the pilot any instructions required to remain clear of conflicting traffic. This training, at a minimum, shall include knowledge of the rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft*; 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*; and 14 CFR 91.155, *Basic VFR Weather Minimums*; knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of appropriate sections of the *Aeronautical Information Manual*.

9.3 Other Personnel Qualifications

Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the subject systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, they must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel on an inter-communication system.

9.4 Maintenance Personnel Qualifications

9.4.1 Ratings

Will be established as more data is collected and a regulatory guideline is developed.

9.4.2 Currency

It is suggested that applicants follow applicable guidelines of 14 CFR 65.83 as appropriate until final UAS regulatory guidelines are available.

9.4.3 Medical

No medical requirements have been defined at this time.

9.4.4 Training

It is highly recommended that a Maintainer/Operator of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process better defines these guidelines.

Revision History

| Date | Action |
|-----------|---|
| 6-01-2005 | Initial release as AFS-400 Policy Memo 05-01, <i>Unmanned Aircraft Systems Operations in the U.S. National Airspace System – Interim Operational Approval Guidance</i> . |
| 3-13-2008 | Cancelled AFS-400 Policy Memo 05-01 and Reissued Updated Document as <i>Interim Operational Approval Guidance 08-01, Unmanned Aircraft Systems Operations in the U. S. National Airspace System</i> . |

Signed

March 13, 2008

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Manager, Unmanned Aircraft Program Office, AIR-160



U.S. Department
of Transportation
**Federal Aviation
Administration**

Public Unmanned Aircraft Operations in the National Airspace System

The Federal Aviation Administration (FAA) is responsible for processing and approving all requests for Unmanned Aircraft System (UAS) operations in the National Airspace System (NAS). For UAS operators, this authorization is granted via the issuance of a Certificate of Waiver/Authorization (COA). Typically, Law Enforcement Agency (LEA) UAS flight operations are considered as "public aircraft" operations. The guidelines for operating as a "public aircraft" entity are described in the FAA's Interim Guidance Document 08-01, which can be found on the FAA web site: <http://www.faa.gov/about/initiatives/uas/>

When the FAA receives a COA application through the FAA's "COA Online" process, the Agency initiates a rigorous program review and application assessment. Included in this review and assessment are 1) the type of mission, 2) launch/recovery/operations location(s), 3) operational altitudes, 4) flight procedures, 5) communications, 6) emergency procedures such as lost communication and loss-of-control link, and 7) pilot in command (PIC), flight crew, and observer qualifications and training requirements. The typical COA application approval process is completed within 60 business days of receipt, provided there are no submittal errors, missing information, or safety or airspace issues.

Before the FAA grants access to the COA on-Line application process, the proponent will be asked to provide some preliminary information that includes, but is not limited to:

- The Proponent's address and contact information, including the accountable executive's name
- The name and manufacturer of the UAS technology to be used
- How the Proponent anticipates utilizing the UAS technology (Concept of Operations)
- The level of aviation experience the Proponent has (e.g. does any member of the Proponent's organization hold private or advanced FAA pilot certificate? or an FAA Airman Medical Certificate?, etc.)
- Will the Proponent be developing the UAS program "in house" or utilizing a third party to develop and/or implement its UAS program?
- A letter from the LEA's State Attorney General formally acknowledging that the Proponent is recognized as a subdivision of the government of the State under Title 49 of the United States Code (USC) section (§) 40102 and that the proponent will operate its Unmanned Aircraft in accordance with 49 USC. § 40125 (not for Commercial Purposes).

The FAA believes that the safest and most successful jurisdiction-wide deployment of UAS technology supporting public safety agencies is accomplished through a two-phase process. The initial COA (Phase I) is generally restricted to training and evaluation activities at a specific training site that is confined to Class G airspace, remaining well clear of housing areas, roads, any persons, and watercraft. This permits LEA's to conduct necessary ground and flight training to bring pilots, observers and ground crewmembers to a high level of UAS flight proficiency and also enables them to develop and conduct training exercises to ensure efficient, standardized coordination among other supporting LEA elements (e.g. SWAT or SRT team coordination for operational missions, search and rescue, disaster control, etc.).

With the *initial* COA Application, several documents need to be submitted by the Proponent. These documents include:

- An airworthiness statement from the Proponent's accountable executive acknowledging that the Proponent accepts all responsibility for ensuring that the UAS is airworthy and that the UAS will be operated and maintained in compliance with the manufacturer's operational and maintenance recommendations
- A lost-link procedures document that addresses the specific lost-link procedure that will be implemented in the event of a lost-link occurrence
- A lost communication procedures document that addresses what actions the Pilot-in-Command (PIC) will take if there is lost communication between PIC and Air Traffic Control, as well as lost communication between PIC and the Visual Observer (VO)
- An emergency procedures document that explains the protocols that will be executed at the site in the event of an emergency (this could include execution of procedures outlined in the operator's manual, possible alternative courses of action available for each phase of flight, and any outside agencies or resources for medical and fire or other assistance)

Once the Proponent feels confident that it can safely operate the UAS at a level of competency to safely support actual LEA missions, the Proponent will apply for a second *operational* COA (Phase II) that typically incorporates the LEA's jurisdiction. As part of the *operational* COA approval, the FAA will conduct an onsite program review and evaluation. This onsite review will include:

- Review of the agency's UAS training and proficiency program, to include all training records
- Review of the agency's Standard Operating Procedures (SOPs) for each phase of flight operation from notification for deployment through preflight, launch, recovery, post-flight and mission record keeping. SOPs must include, at a minimum, emergency procedures and standards for expected scenarios (e.g. lost-link, lost communications between VO and PIC or between PIC and ATC, medical emergencies, etc.), Crew Resource Management, sterile ground control station protocols, PIC and VO standard communications and any special mitigation procedures
- Review of the Proponent's Safety Risk Analysis Plan (SRAP) that specifically identifies the boundaries of the Proponent's jurisdiction, and all unique operational areas within that jurisdiction and their attendant hazards (Note: The SRAP must include a description of specific risk controls the Proponent will employ to mitigate any attendant hazard for UAS)
- An evaluation by the FAA of a UAS exercise to demonstrate the competency and safety of the Proponent's program

The FAA is committed to safely integrating UAS into the NAS and looks forward to working with public safety agencies in developing UAS Programs. If you have questions, please direct them to one of the below contacts:

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